



# RECLAMATION

*Managing Water in the West*

## Reservoir & River System Management

Great Falls, Montana  
May 28, 2008

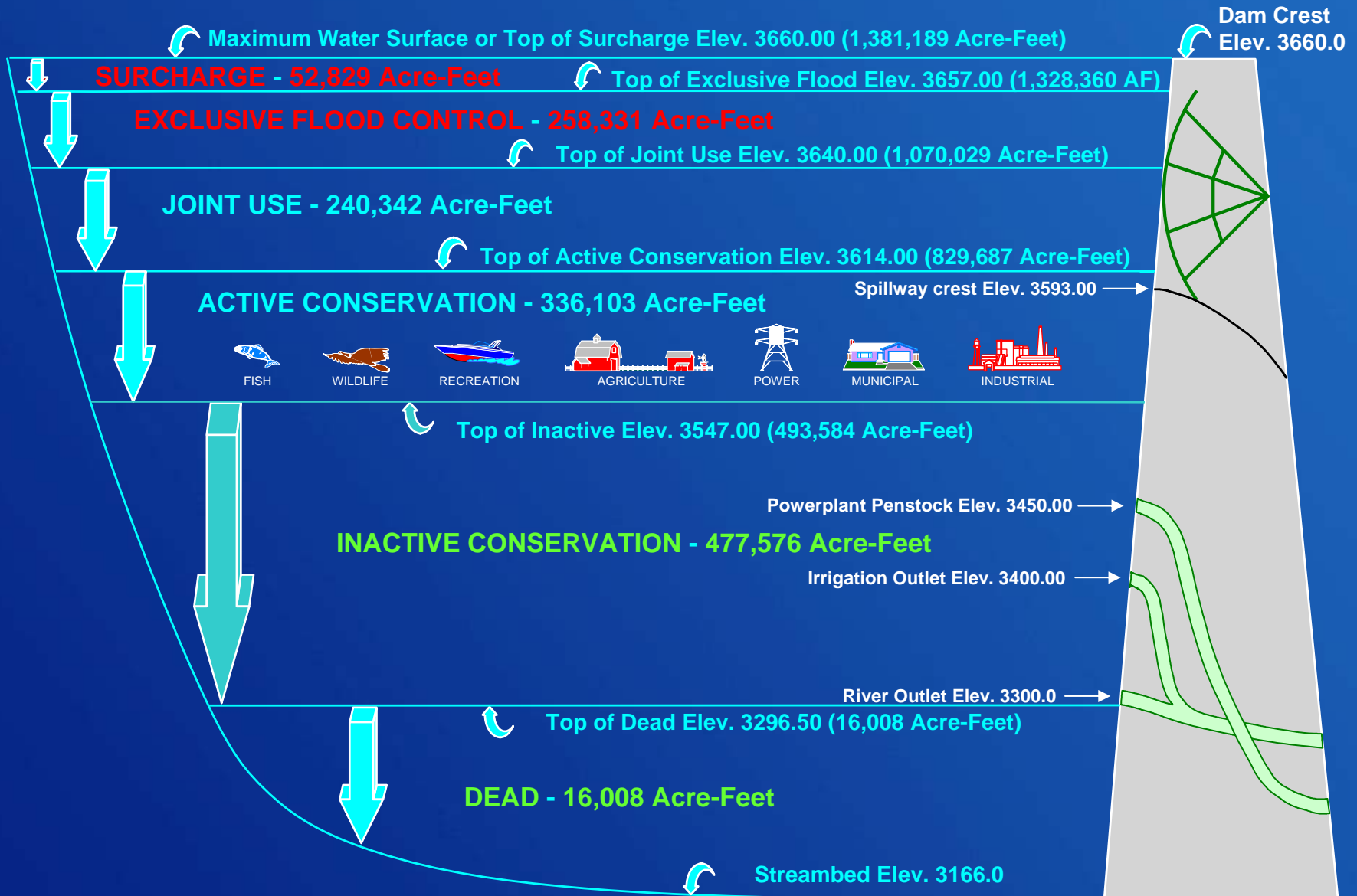
- “There is only one river with a personality, habits, dissipations, and a sense of humor; a river that goes traveling sidewise, that interferes in politics, rearranges geography, and dabbles in real estate; a river that plays hide and seek with you today and tomorrow follows you around like a pet dog with a dynamite cracker tied to its tail.”
- Writer George Fitch’s 1907 characterization of the Missouri River.

# Reservoir Management Factors

- Reservoir Characteristics - Storage Allocation
- River System
- Legal Requirements
- Multipurpose Objectives
- Water Supply/Runoff Conditions
- Management Tools
- Operating Criteria

RECLAMATION

# BIGHORN LAKE STORAGE ALLOCATIONS



# RECLAMATION

# Mandatory or Legal Requirements

- Senior Water Rights
- Interstate Compacts
- Reserved Water Rights (Compacts/Decrees)
- International Treaties
- Contract Commitments
- Formal Operating Agreements
- Dam Safety Requirements

RECLAMATION

# Multipurpose Objectives

- Irrigation Supply
- Municipal and Industrial Supply
- Power Generation
- Flood Control
- Recreation
- River Fishery Flows
- Reservoir Fishery and Waterfowl Needs
- Water Quality
- Sediment Retention

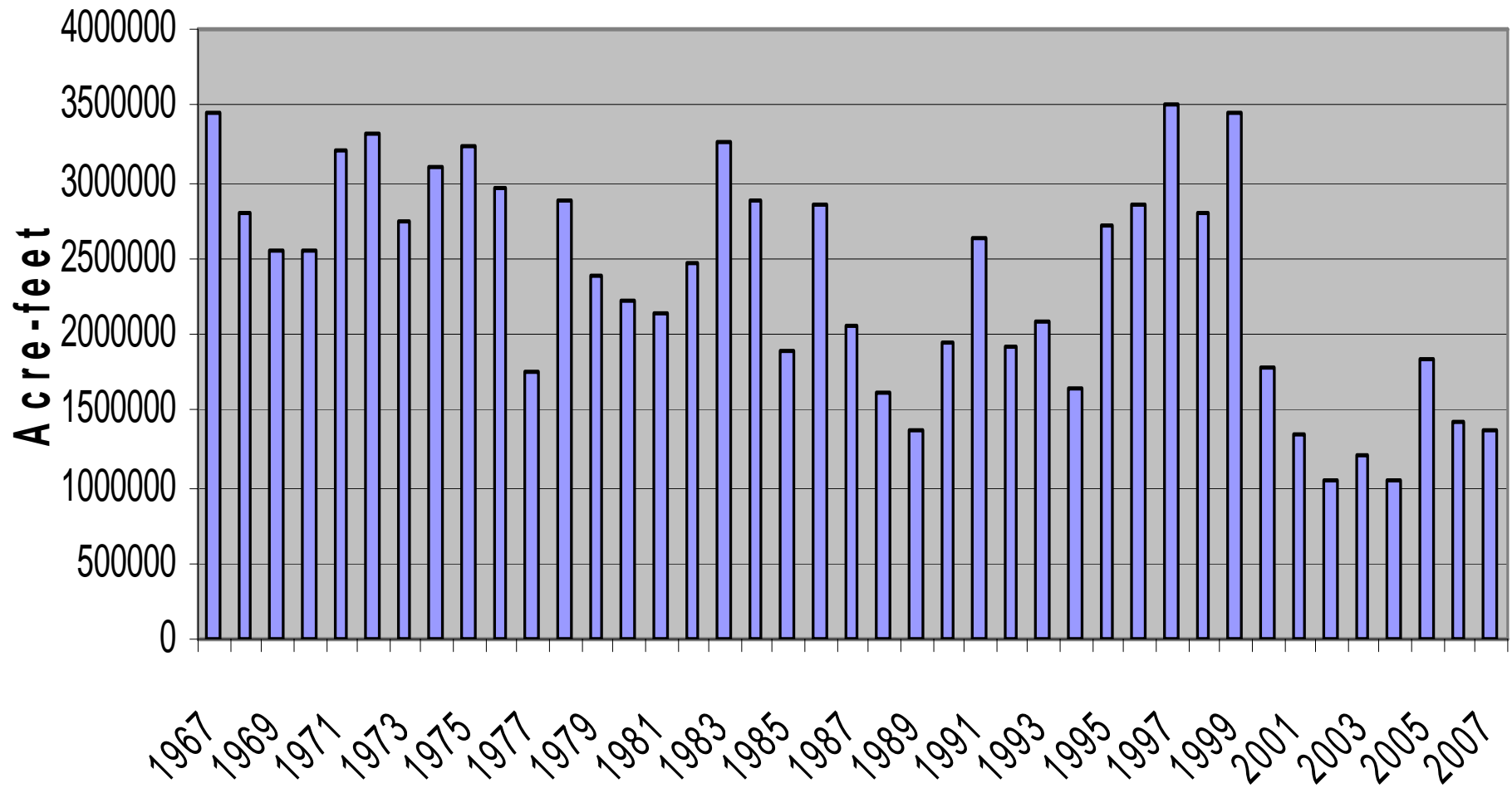
RECLAMATION

# Water Supply Evaluation

- Hydrologic Record
- Upstream Depletions – Existing and Future
- Upstream Reservoir Effects
- Adjusted Hydrologic Record
- Reservoir and River System Modeling – Long Term
- Reservoir Operating Criteria – Rule Curves

RECLAMATION

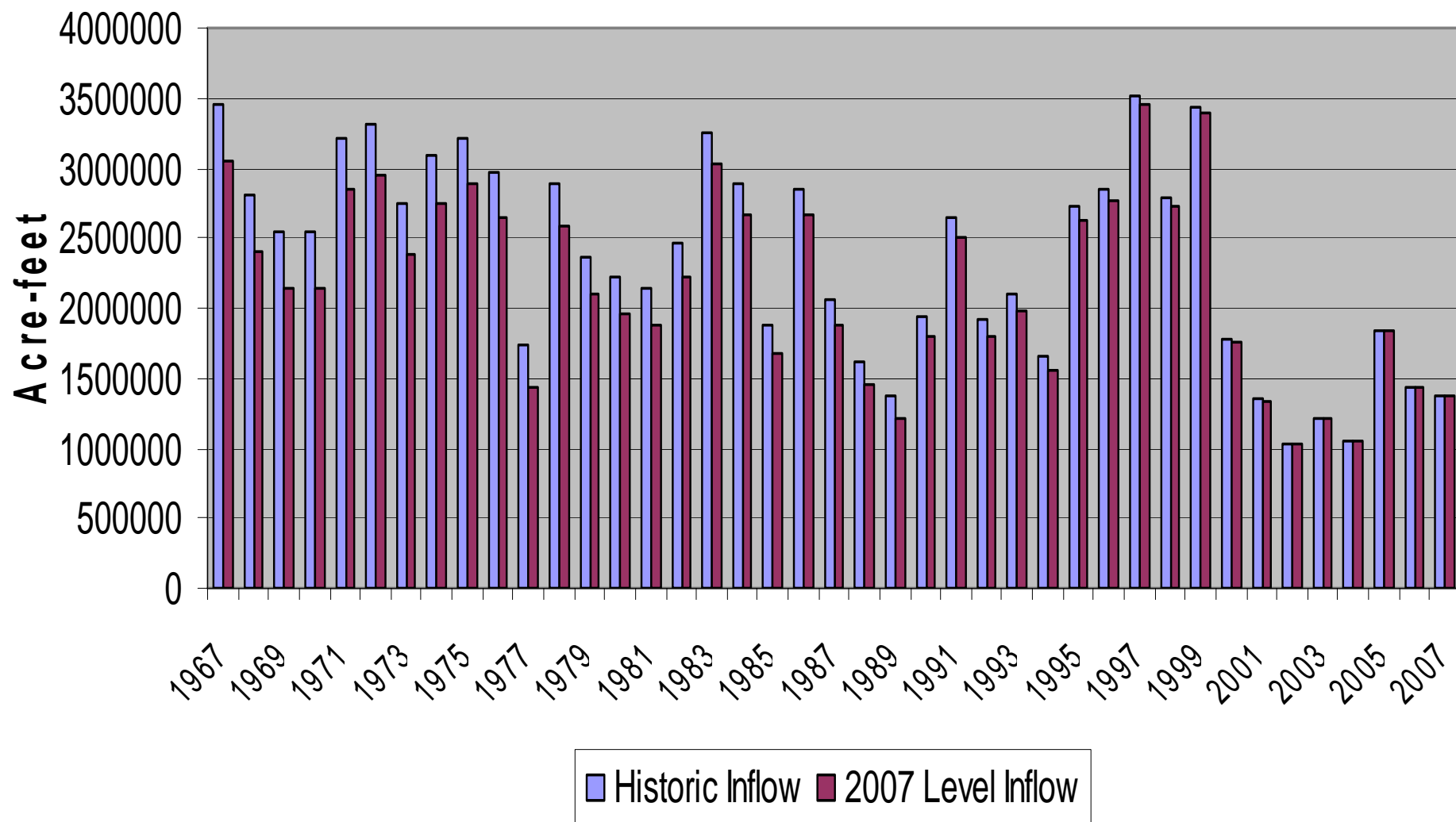
# Bighorn Lake Annual Inflow



RECLAMATION



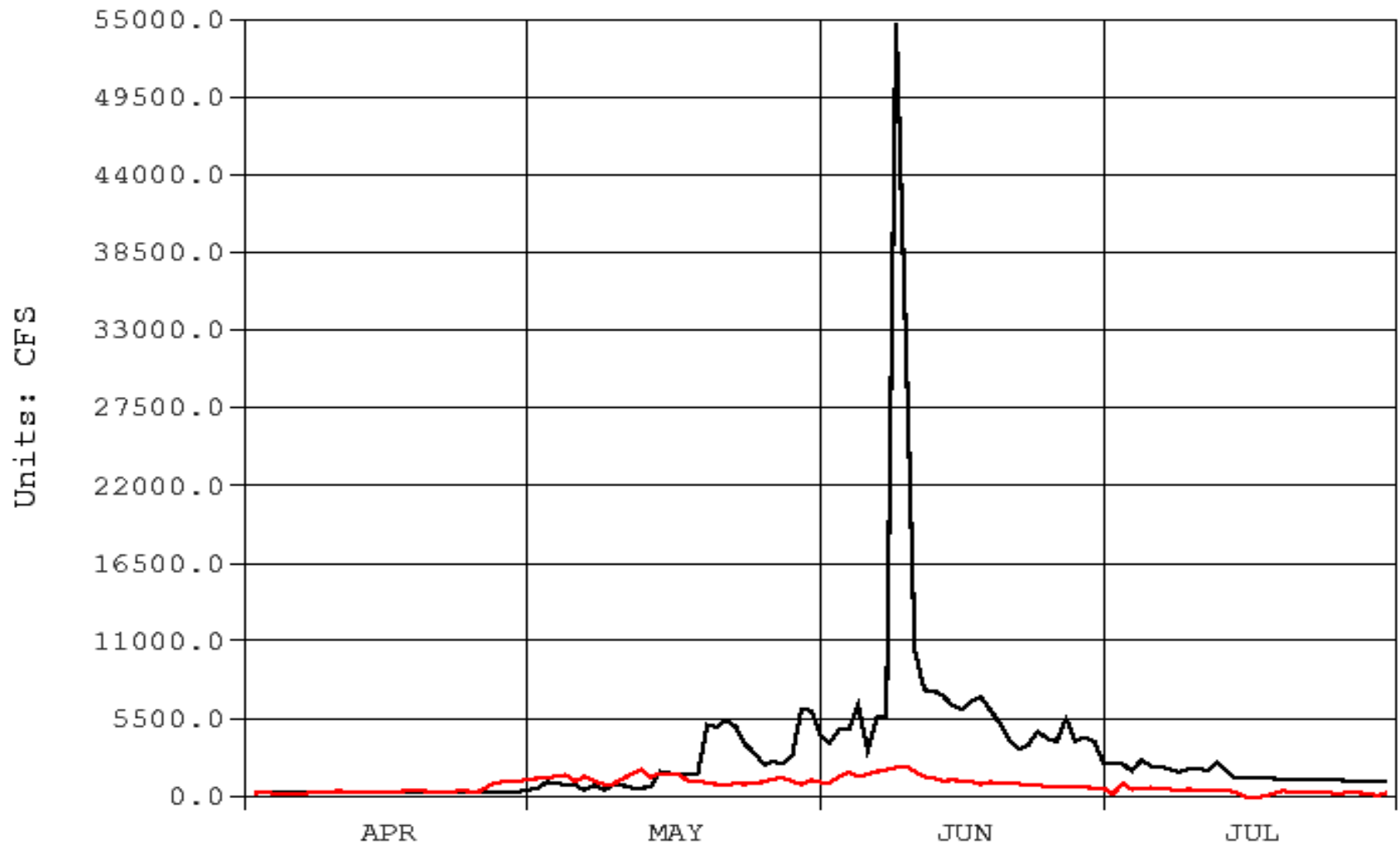
# Bighorn Lake Annual Inflow



RECLAMATION

Archive Data From 1-APR Through 30-JUL

Plotted 05/01/2008 15:11



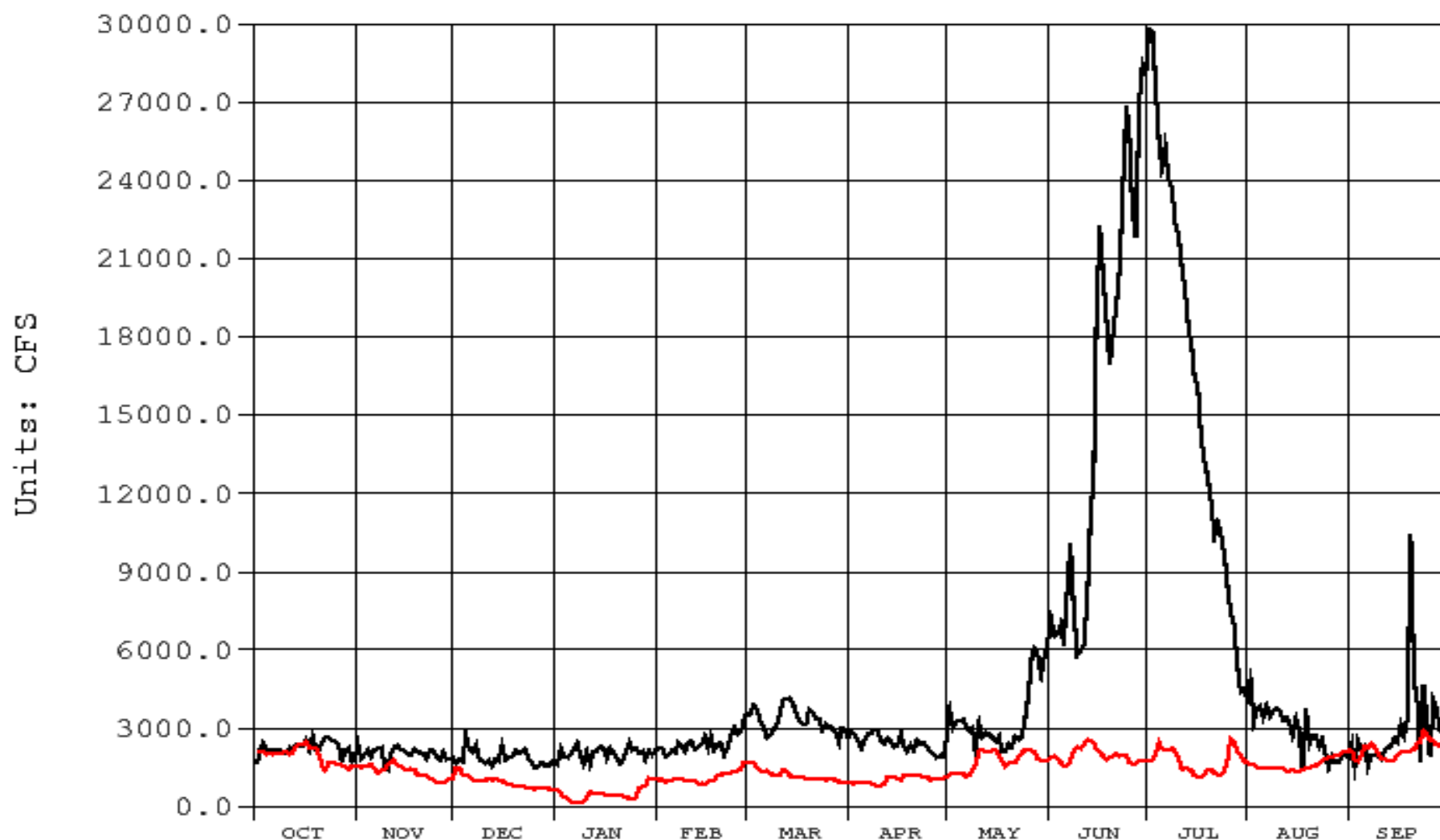
GIBR Gibson Reservoir, Sun River near Great Falls, MT  
IN Daily Mean Computed Inflow (cfs)

1964 1977

RECLAMATION

Archive Data From 1-OCT Through 30-SEP

Plotted 05/01/2008 14:41



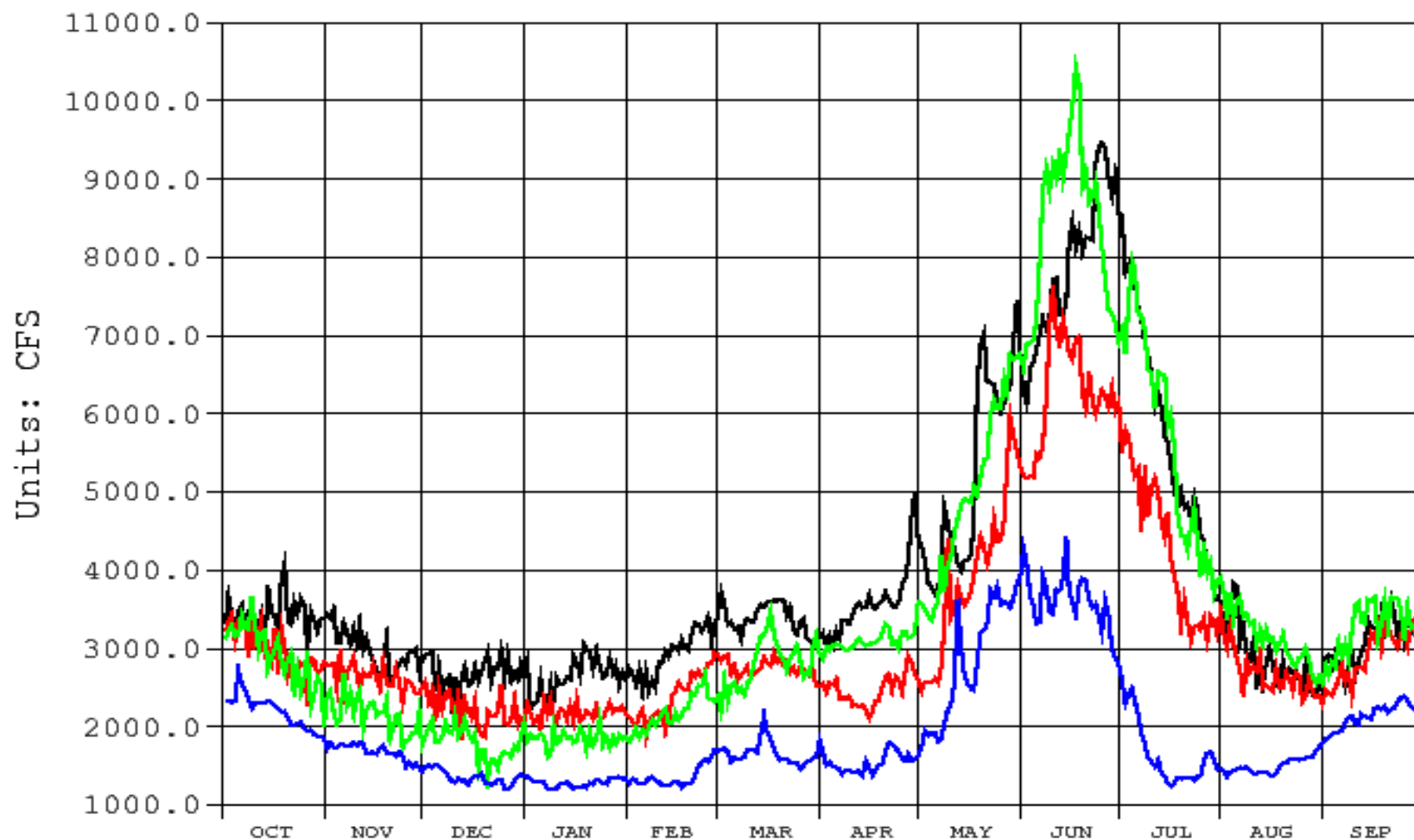
BHR Bighorn Lake (Yellowtail), Bighorn River near Fort Smith, MT  
IN Daily Mean Computed Inflow (cfs)

1967 2004

RECLAMATION

Archive Data From 1 OCT Through 30 SEP

Plotted 04/29/2008 14:45



BHR Bighorn Lake (Yellowtail), Bighorn River near Fort Smith, MT

— IN 10yr avg Daily Mean Computed Inflow (cfs)

— IN 8yr avg Daily Mean Computed Inflow (cfs)

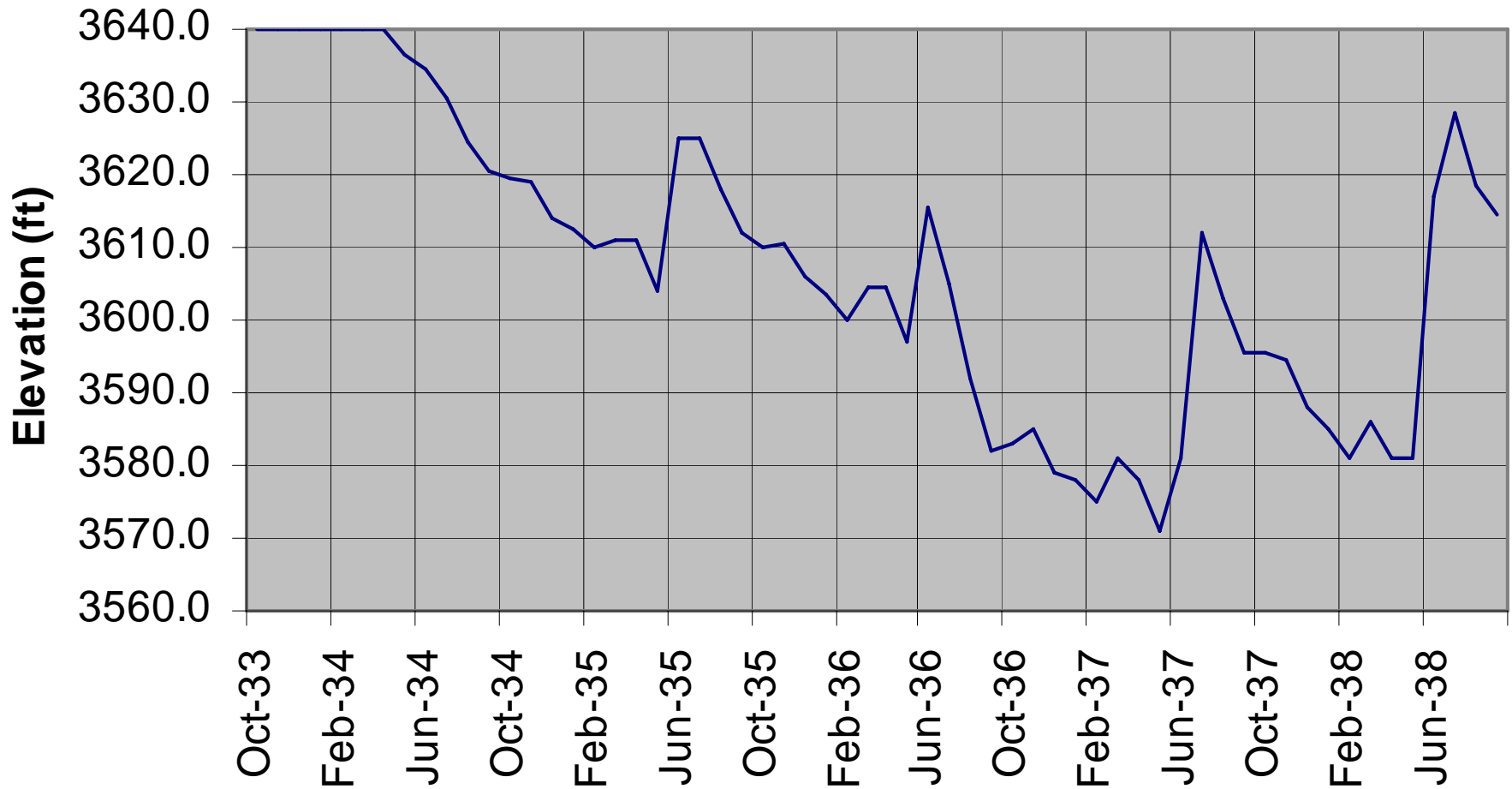
1979 1989 1999

2007

RECLAMATION

# Bighorn Lake Forebay elev. (ft)

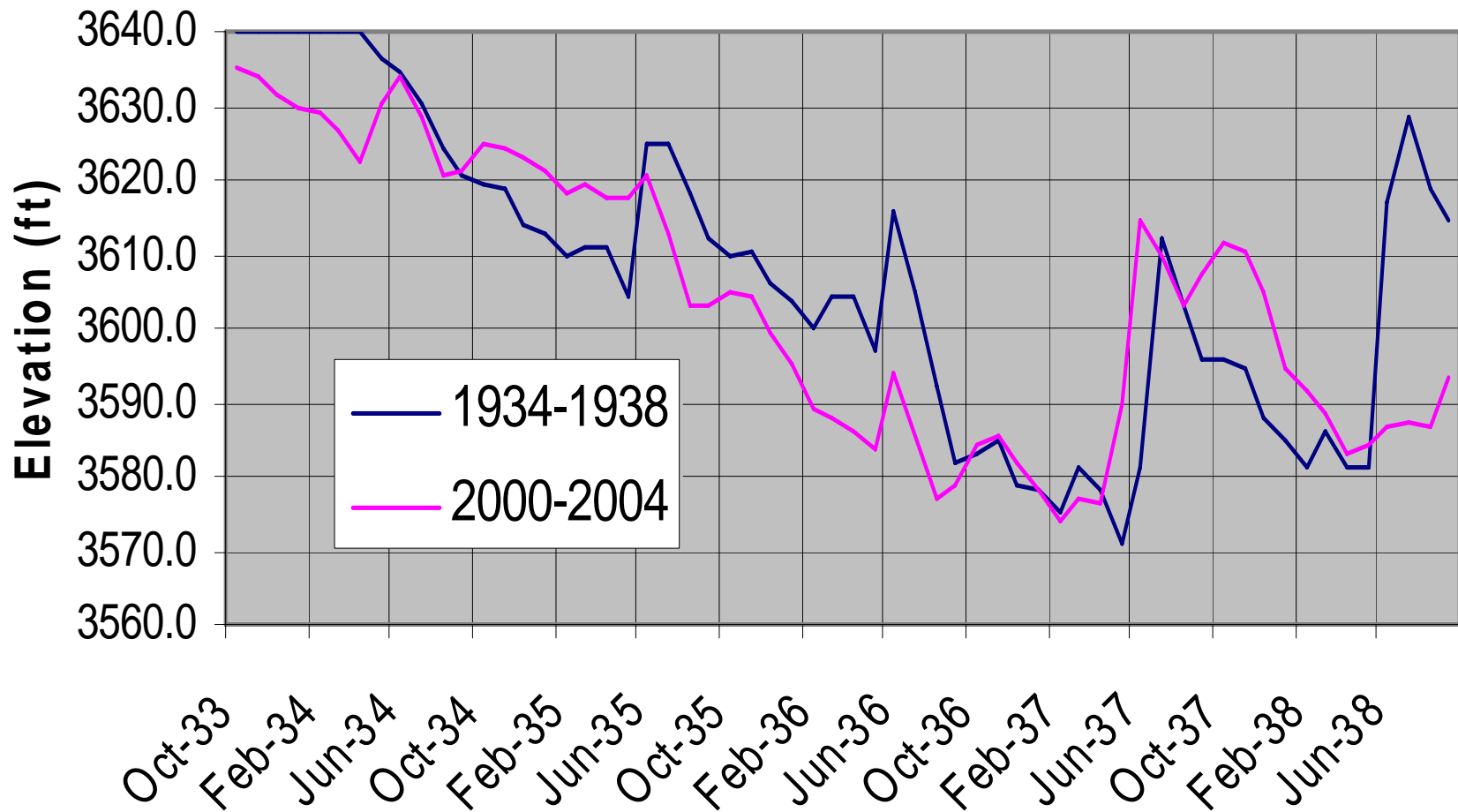
## Water Years 1934-1938



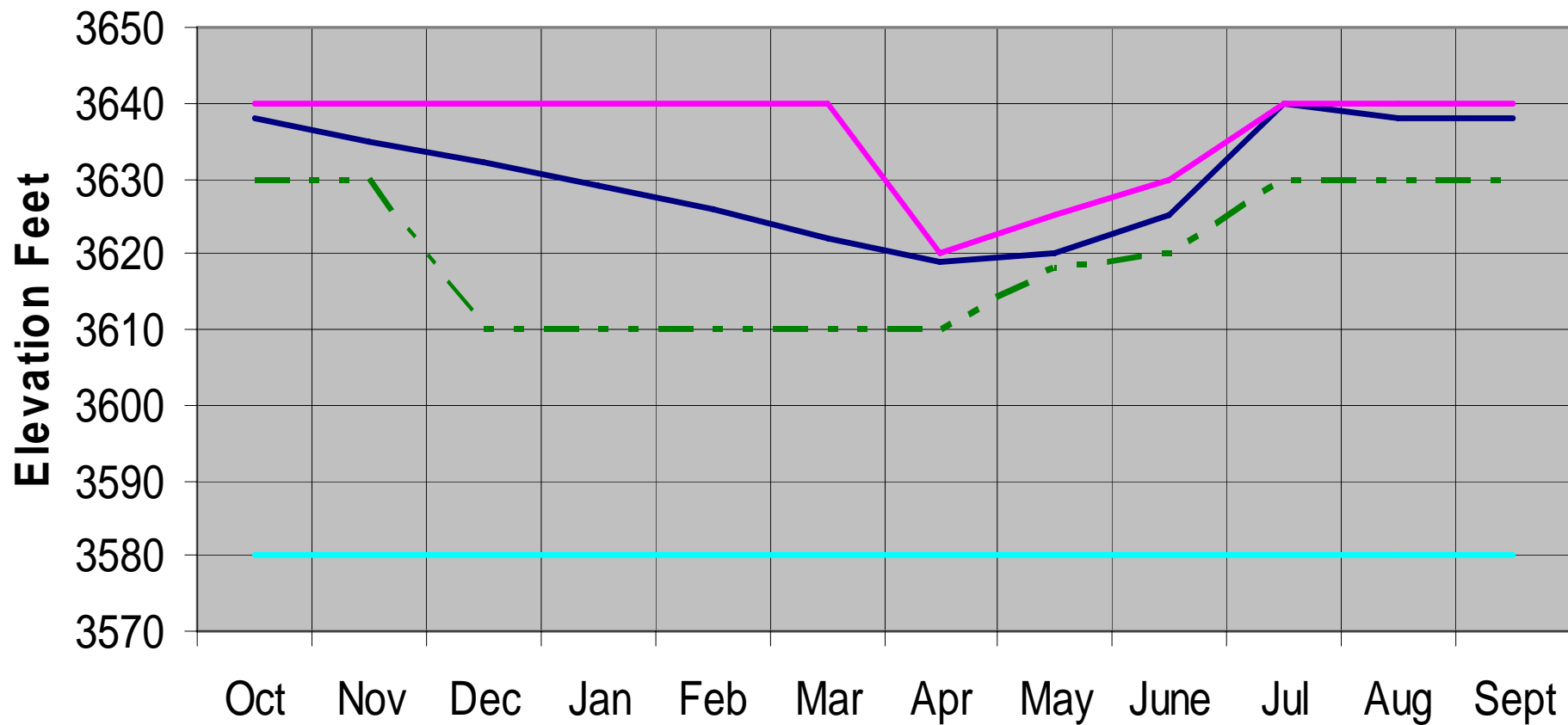
RECLAMATION

# Bighorn Lake Forebay Elev. (ft)

## 1934-1938 DPR vs 2000-2004 Actual



# Reservoir Rule Curve

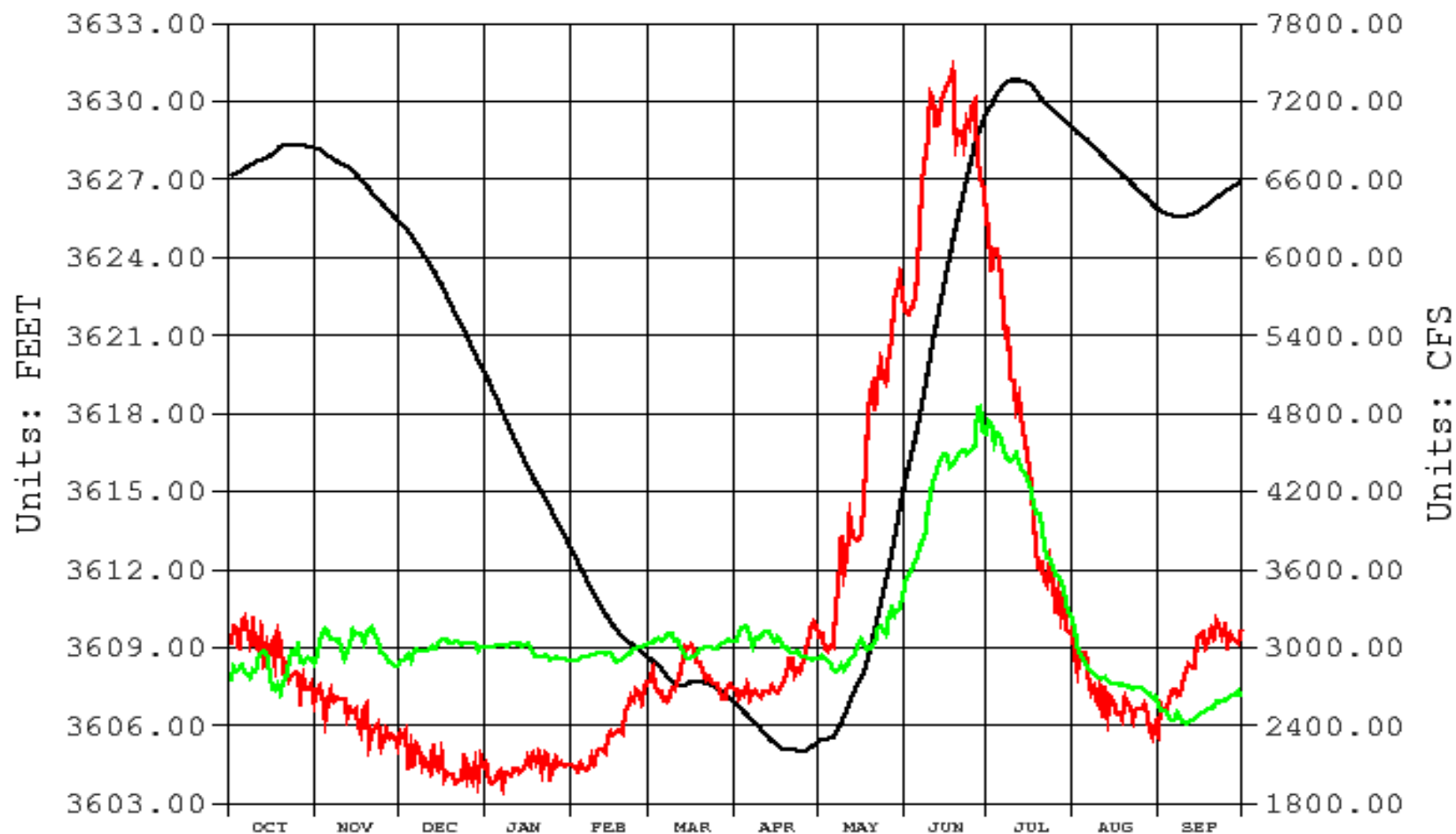


— Plan    — Flood Control Limits    - - - Recreation Limits    — Min Content

RECLAMATION

Archive Data From 1 OCT Through 30 SEP

Plotted 05/13/2008 15:23



BHR

Bighorn Lake (Yellowtail), Bighorn River near Fort Smith, MT

2007

FB

40yr avg Reservoir Forebay Elevation (feet)

2007

IN

40yr avg Daily Mean Computed Inflow (cfs)

2007

QRD

40yr avg Daily Mean River Discharge (cfs)

2007

RECLAMATION



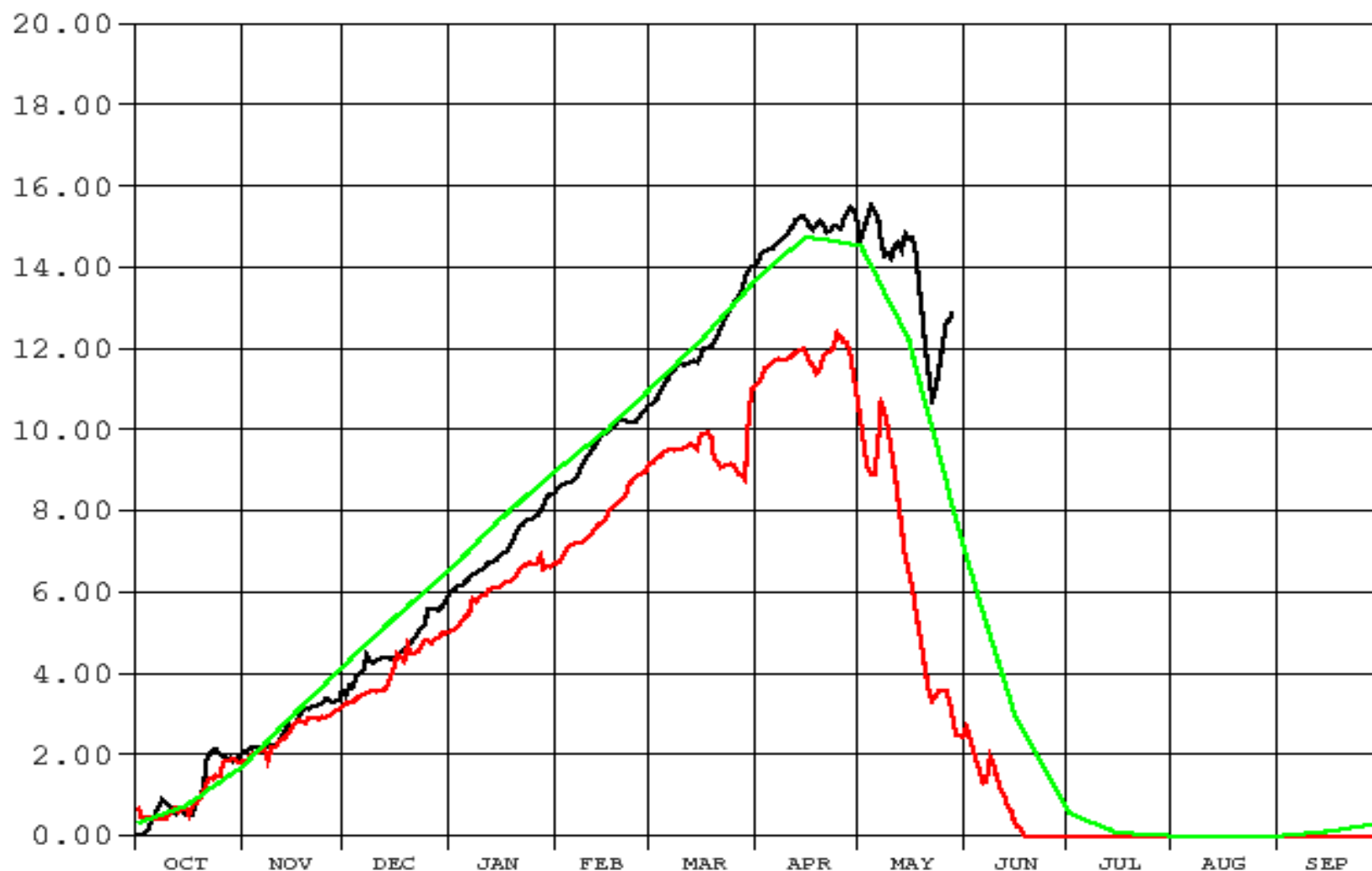
# Reservoir Management Tools

- **Real Time Water Supply Monitoring**
  - River Flow & Reservoir Levels (USGS, USBR, COE)
  - Mountain Snowpack (NRCS)
  - Weather Conditions (NWS)
- **Snowmelt Runoff Forecasts (NRCS/NWS)**
- **Short Term River Flow Forecasts (NWS/NRCS)**
- **Demand Forecasts**
- **Weather Forecasts (NWS)**
- **Monthly Operating Plan Model– (AOP) Next 12 Months**
- **Spreadsheet Accounting/Daily Models**

Archive Data From 1-OCT Through 30-SEP

Plotted 05/27/2008 13:40

Units: INCHES



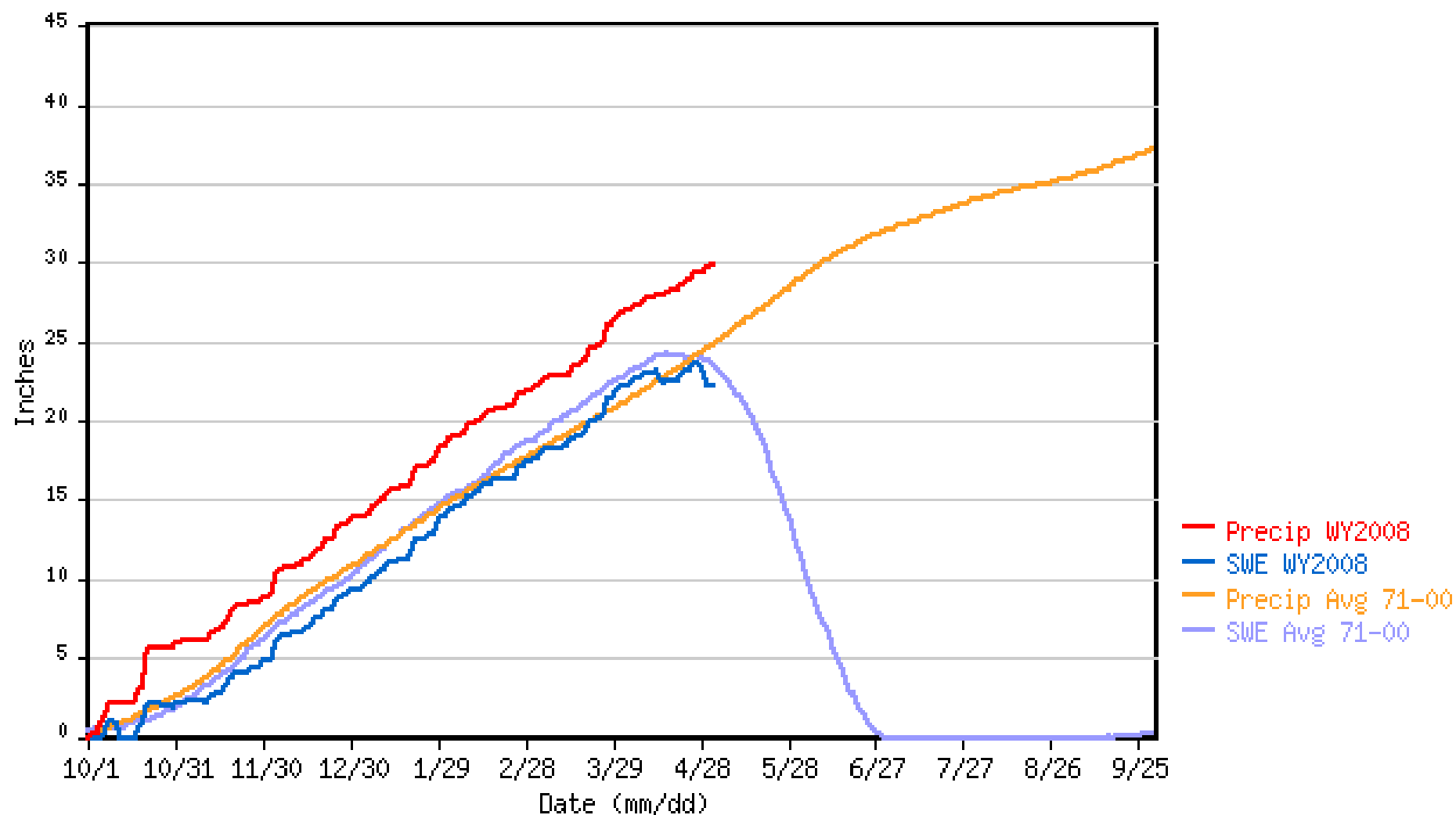
BHR Bighorn Lake (Yellowtail), Bighorn River near Fort Smith, MT  
SE Snow Water Equivalent (inches)  
SE\_AVG Snow Water Equivalent Average (inches)

2008 2007  
2007

RECLAMATION






## SYLVAN LAKE SNOTEL for Water Year 2008

\*\*\* Provisional Data, Subject to Change \*\*\*



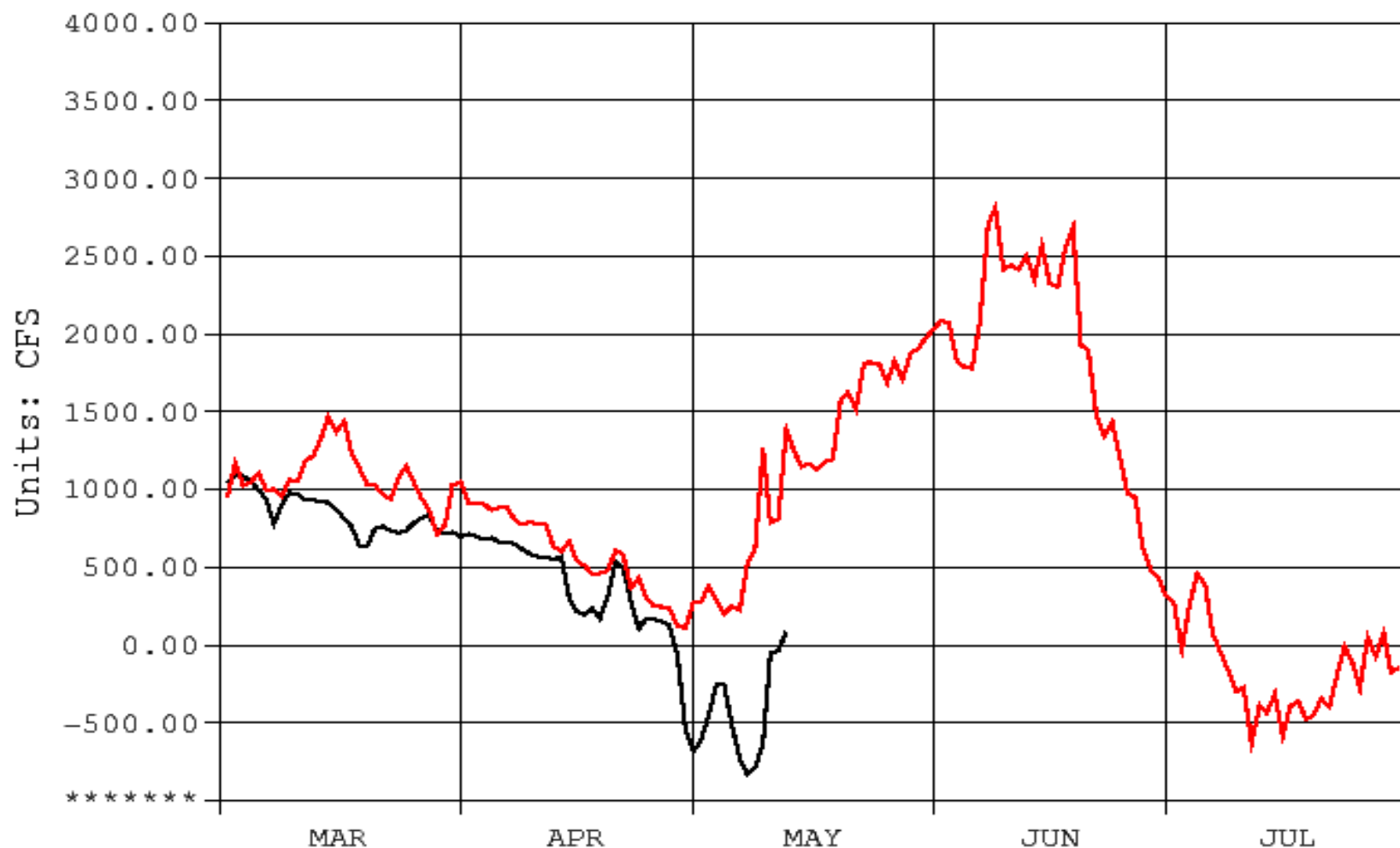
# FORECASTS

DATA CURRENT AS OF: 4/08/08 06:34:55

<b>NF SHOSHONE RIVER at Wapiti</b> APR-JUL Average = 460.0	90% Exceedance	 88%
	70% Exceedance	 104%
	50% Exceedance	 115% ( 530.00)
	30% Exceedance	 126%
	10% Exceedance	 142%

Archive Data From 1 MAR Through 30 JUL

Plotted 05/13/2008 15:41



BHR

Bighorn Lake (Yellowtail), Bighorn River near Fort Smith, MT

— GAIN

Daily Computed Gain (cfs)

2008

— GAIN

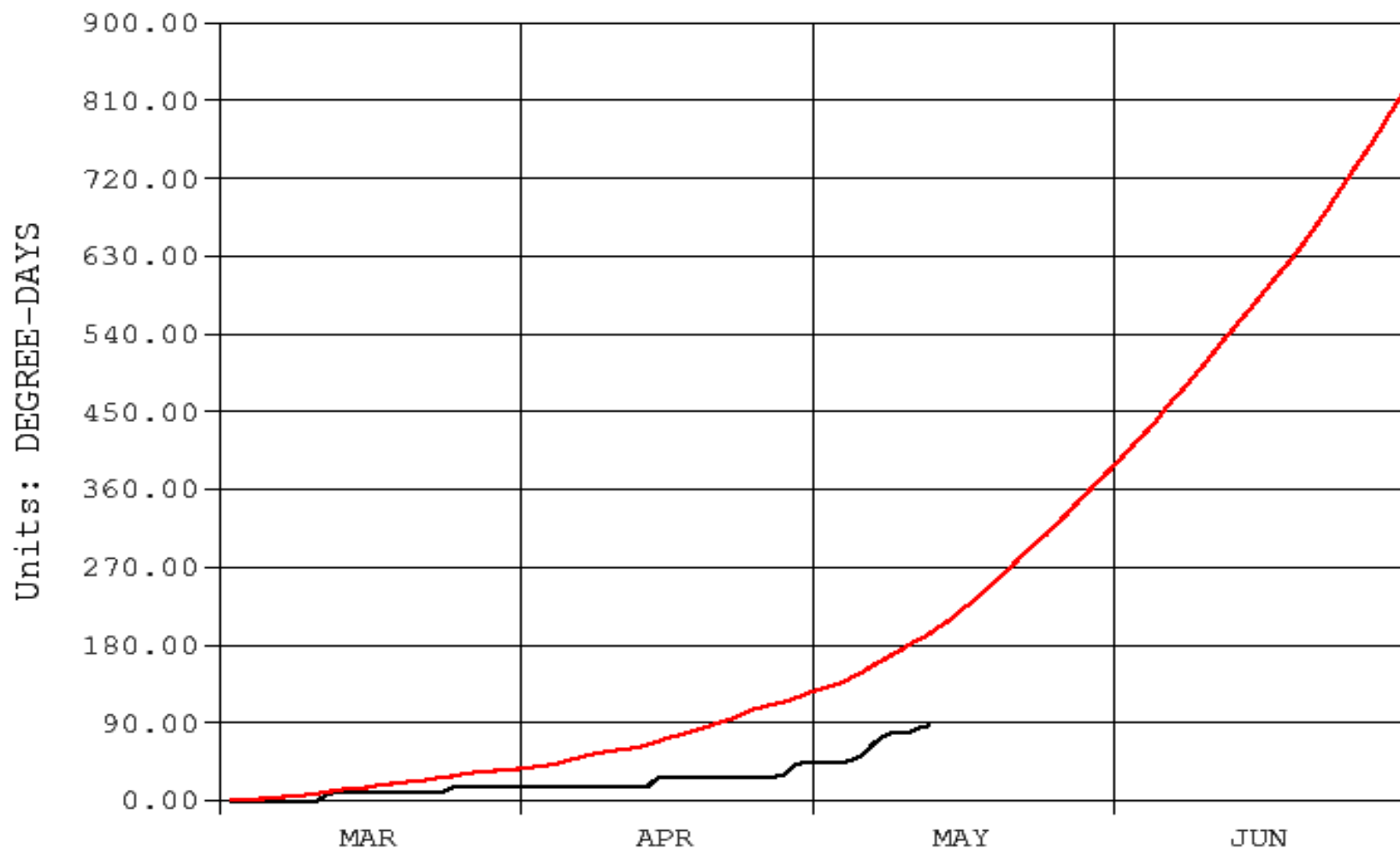
20yr avg Daily Computed Gain (cfs)

2007

RECLAMATION

Archive Data From 1 MAR Through 30 JUN

Plotted 05/13/2008 15:55



NFS

North Fork Shoshone River near Wapiti, WY

— MN

Cumulative Daily Min. Air Temp. above 32 (degree-days)

2008

— MN

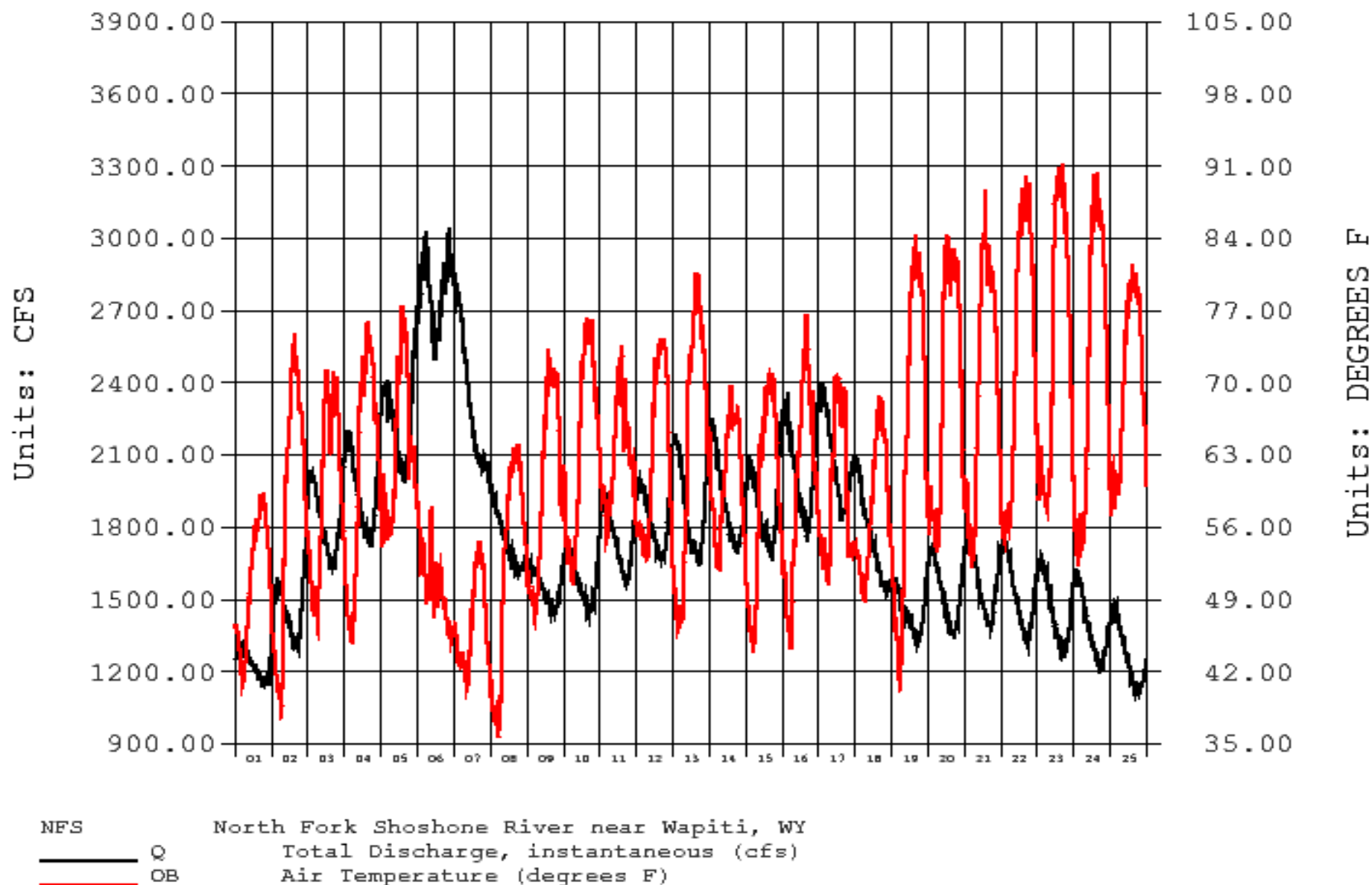
20yr avg Cumulative Daily Min. Air Temp. above 32 (degree-days)

2007

RECLAMATION

Dayfile Data From 01-JUN-2007 Through 25-JUN-2007

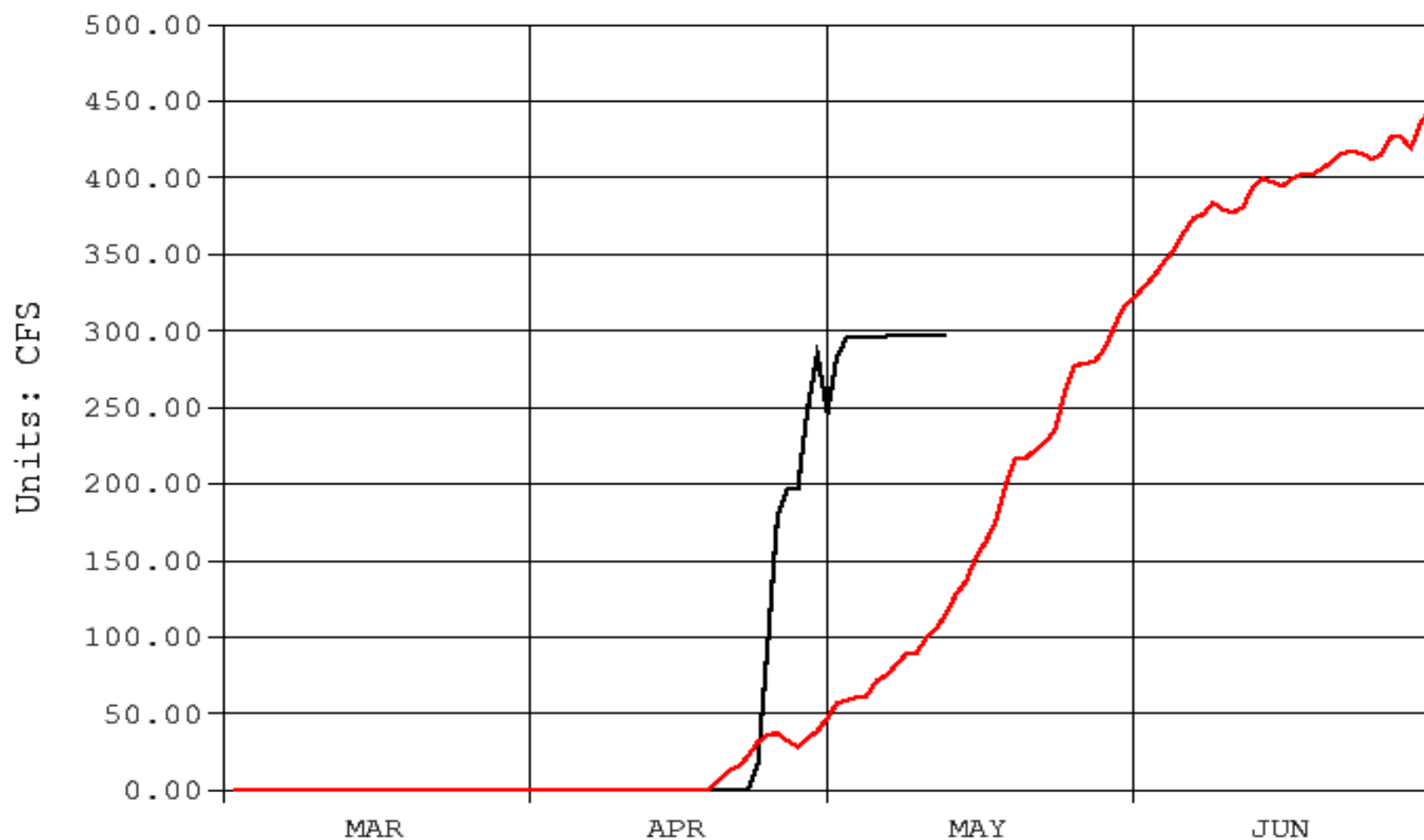
Plotted 05/02/2008 09:36



RECLAMATION

Archive Data From 1 MAR Through 30 JUN

Plotted 05/13/2008 16:02



BHSX Bighorn River near St. Xavier, MT

QJ Daily Mean Canal Discharge (cfs)

2008

BHR Bighorn Lake (Yellowtail), Bighorn River near Fort Smith, MT

QJ 20yr avg Daily Mean Canal Discharge (cfs)

2007

RECLAMATION



# QUESTIONS & COMMENTS

RECLAMATION